Science Program presents

Molecular Coplanarity of π-Conjugated Organic Systems: from Synthesis to Function

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Coplanar torsional conformation plays a key role in shaping the unique characteristics and functions of conjugated organic molecules and macromolecules. It is still an elusive task, however, to control the coplanar conformation of conjugated polymers for materials performance. We aim to establish general synthetic methodology and comprehensive structure-properties correlations of coplanar π-systems, through synergistic approaches combining chemical synthesis, process engineering, and materials characterization. In order to achieve molecular coplanarity, we have designed and implemented multiple strategies, including the use of non-covalent bridging bonds, the employment of dynamic covalent reactions, and the use of highly efficient annulation reactions. Efforts were also made to solve the challenge of low solubility of this class of materials for characterization and processing. Unique optical, electronic and mechanical properties of these new materials are investigated and optimized for advanced applications.

Lei Fang obtained his BS (2003) and MS (2006) degrees from Wuhan University in China, before moving to the US and receiving his PhD diploma (2010) from Northwestern University. Lei then spent two and half years at Stanford University as a postdoctoral scholar. In 2013, he started his independent academic career as an assistant professor at Texas A&M University, where he leads a multidisciplinary research group studying functional organic materials with electronic, thermal or photo-activity. His current research goal is to gain insights into design principles and structure-property relationships of these materials at both the molecular and the macroscopic scale by employing the toolboxes of synthetic chemistry and process engineering. In particular, the Fang research group focuses on the bottom-up synthesis and processing of ladder polymers and microporous polymer networks for applications associated with electronics and energy conversion/storage.

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